

The 3d scanning of a 17th Century Clay Pipe

3D Scanners scan & create a watertight model for South West Maritime Archaeological Group

The Customer

The 'South West Maritime Archaeological Group' [SWMAG], is a small team of dedicated, self-funded, amateur underwater archaeologists. The aims of the team are to investigate the underwater cultural heritage sites off the South Devon coast.

One of the major historical wreck sites under investigation is the 'Salcombe Cannon Site', which lies east of Salcombe in approximately 18 metres of water where the team have been diving since April 1995.

Project Aim

A very rare and extremely decorative, 17th Century Clay Pipe recovered from the site will be acquired by The British Museum during 2016. Before this acquisition occurs, the team decided that a small quantity of high quality replicas to support outreach presentations should be made available to historical societies, schools, conferences, museums etc. The clay pipe is very fragile and a non-contact method of creating replicas of its shape and decorative features was essential to ensure that no damage occurred during the process.



3D Scanners (UK) were asked to scan and create a high detailed 'watertight' 3D model. 3D Scanners decided to use the Gom ATOS Triplescan.....

The ATOS Triple Scan produces high accuracy data on complex components with deep pockets or fine edges, reducing the number of individual scans and resulting in simple handling. It is also equipped with blue light technology. The narrowband blue light enables precise measurements to be carried out independently of environmental lighting conditions.

The scanner uses high resolution measuring cameras with up to 16 megapixel resolution and has specially developed optics for highly detailed, small parts with measuring volumes down to 38mm., but also capable of scanning large parts at high resolution.

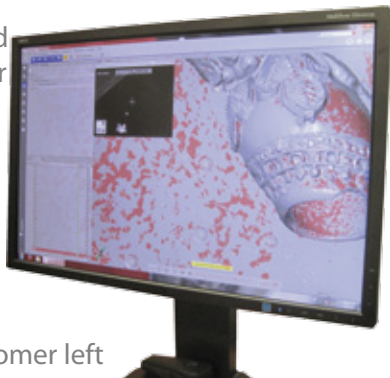
The engineer using the Gom ATOS Triplescan



The Scanning

As the clay pipe was so fragile, the engineer was unable to put reference points on the item. This is normally used for aligning the data captured in separate scans. So instead the engineer selected a measuring volume of 100 (100x75x75, MV 100) to allow capture of reference datums within this area. Three separate scans were taken, one of each side and one looking down the bowl. The resolution was set to 31 microns to capture the intricate detail on the pipe.

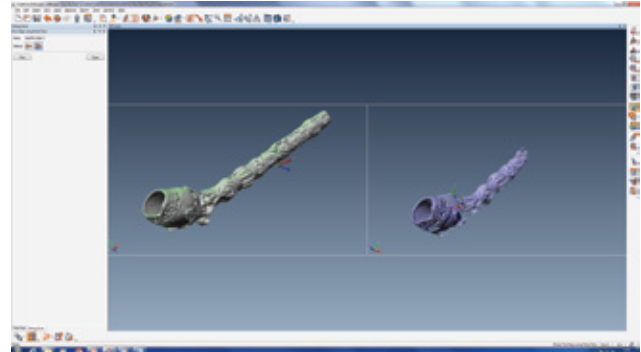
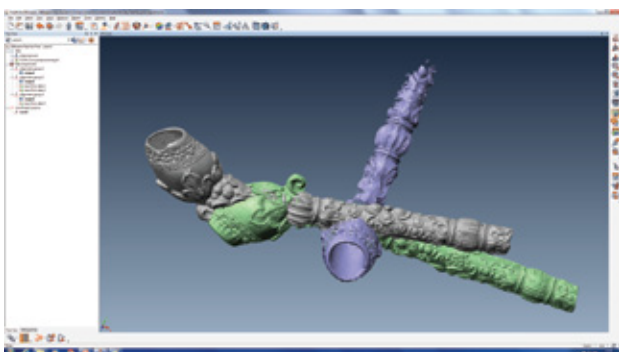
The engineer could show the customer the data being captured during the scan and the resolution being achieved.



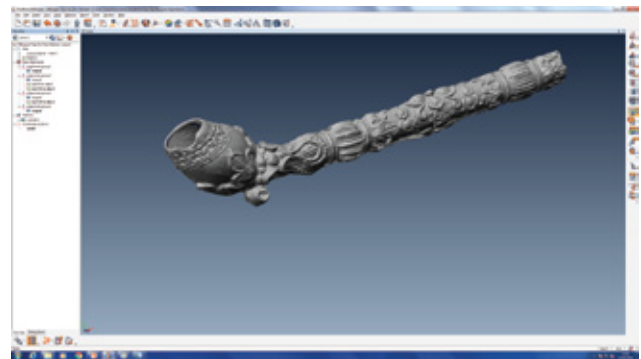
Once the data was captured, the customer left the 3D Scanners site with the artifact and the data was aligned using PolyWorks software in our 3D Scanners offices.

Alignment

The engineer carried out an 'n' point alignment, which 'knitted' two of the scans together and then a third is added to the previously aligned two. This is followed by a best fit alignment which will then shuffle these scans until the best fit is achieved. The engineer then 'merged' the scan. This creates a polygon mesh at the push of a button in PolyWorks software and takes little time to process.



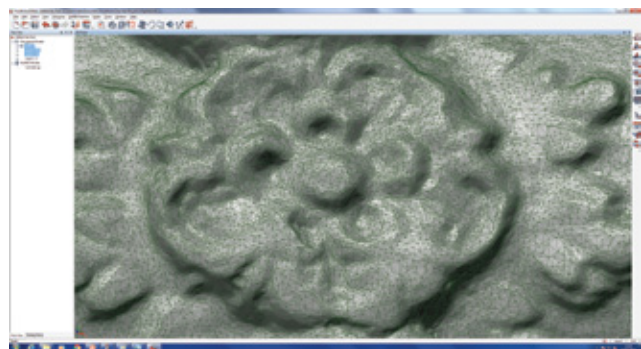
The screenshots show the scans whilst using n point alignment.

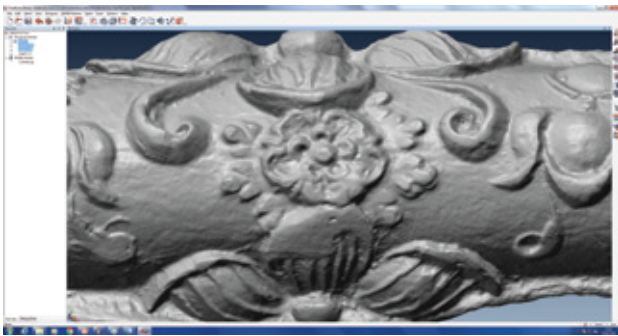


Editing The Model

The polygon model was edited in PolyWorks|Modeler filling any tiny holes and optimising the mesh to produce the nearest 3d representation with equilateral triangles allowing a smooth mesh model..

The screenshot below is a close up in PolyWorks|Modeler showing the optimised mesh.





The screenshots show the finished polygon mesh pipe detail in PolyWorks software.

The 3D Model

The customer received a 3d polygon model (stl) which can be imported into most 3d printers to create as many replicas as required. The 3D visual representation can also be used for 3d digital records.

Pipe Description

The pipe is 130mm long, the bowl is 29mm high and the stem between 10mm and 14mm thick. The stem bore is 3/32" (2.4mm). A small fragment is missing from the rim of the bowl and part of the mouthpiece end of the stem is also lost. The fabric is off-white and fine-grained with few inclusions. The pipe was made in a two-part mould and is elaborately decorated throughout its surviving length. Sooting within the bowl and absorption of

nicotine and tars in the body of both bowl and stem suggests that the pipe had been smoked a number of times before its breakage or loss.

The pipe has also been the subject of a research paper carried out at the request of SWMAG, details as follows; Society for Post-Medieval Archaeology (SPMA) Volume 37, Issue 1 (2003), pp. 159-163 'A 17th-century clay pipe from the Salcombe wreck site' P. J. DAVEY

Abstract

"The Salcombe find is a Dutch Baroque Type 3 pipe of unusually high quality, exhibiting a variety of unique decorative elements and dating from 1635 to 1645. Although probably of Amsterdam or Gouda manufacture, it may have emanated from one of a number of early minor centres in the Netherlands. Given the absence of such pipes in England and Scotland and the unique detail displayed in this object, it would seem most likely to have been a personal possession purchased in Holland by one of the passengers or crew. There is no evidence that pipes of this type were ever traded to Britain and the Salcombe example may never have ended up in this country had the ship carrying it not been wrecked off the Devon coast".